

## Bell Ringer

Wednesday 10/23

Re-Write each of the following functions in factored form and identify the x-intercepts:

1.  $y = -x^2 + 6x - 5$

$$y = -1(x^2 - 6x + 5)$$

$$y = -1(x - 1)(x - 5)$$

$$x - 1 = 0$$

$$(1, 0)$$

$$x - 5 = 0$$

$$(5, 0)$$

2.  $y - 3 = 2x^2 + 5x - 6$

$$y = 2x^2 + 5x - 3$$

$$y = 2x^2 - 1x + 6x - 3$$

$$x(2x - 1) + 3(2x - 1)$$

$$y = (2x - 1)(x + 3)$$

$$2x - 1 = 0$$

$$\frac{2x}{2} = \frac{1}{2}$$

$$x = \frac{1}{2}$$

$$x + 3 = 0$$

$$(-3, 0)$$

$$\left(\frac{1}{2}, 0\right)$$

3.5 online hw due tomorrow!

Standard 3A Opportunity 1 - Friday

$$f(x) = -2(x-3)^2 + 1$$

$$f(x) = x^2$$

# correct Mondays ws!

Vertex Form using:  $h = \frac{-b}{2a}$ ,  $k = f(h)$  Name: Key Hr: \_\_\_\_\_

Axis of symmetry:  $x = h = \frac{-b}{2a}$   $k = f(h)$  Vertex:  $(h, k)$  Vertex form:  $y = a(x - h)^2 + k$

1-6. Use the formula  $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$  to find the vertex and then write the equation in vertex form.

1.  $y = x^2 - 6x + 1$   
 $\frac{b}{2a} = 3$   $(3, -8)$   
 $y = (x - 3)^2 - 8$

2.  $y = -4x^2 + 16x - 11$   
 $\frac{-16}{2(-4)} = \frac{-16}{-8} = 2$   
 $(2, 5)$   
 $y = -4(x - 2)^2 + 5$

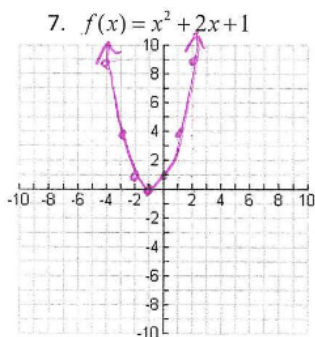
3.  $y = x^2 - 8x + 18$   
 $\frac{8}{2(1)} = \frac{8}{2} = 4$   $(4, 2)$   
 $y = (x - 4)^2 + 2$

4.  $f(x) = -x^2 + 2x + 5$   
 $\frac{-2}{2(-1)} = \frac{-2}{-2} = 1$   $(1, 6)$   
 $y = -(x - 1)^2 + 6$

5.  $y = 2x^2 - x + 1$   
 $\frac{-(-1)}{2(2)} = \frac{1}{4}$   $\left(\frac{1}{4}, \frac{7}{8}\right)$   
 $y = 2\left(x - \frac{1}{4}\right)^2 + \frac{7}{8}$

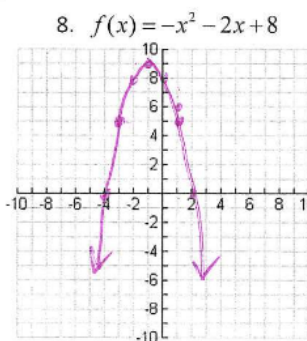
6.  $f(x) = x^2 - 8x + 16$   
 $\frac{-(-8)}{2(1)} = \frac{8}{2} = 4$   $(4, 0)$   
 $y = (x - 4)^2$

7-8. Find the following: (a) write the equation in vertex form, (b) identify vertex, (c) identify axis of symmetry, (d) state if vertex is a max or a min, (e) sketch graph, (f) x-intercepts, (g) y-intercept, (h) domain and range.



$\frac{-2}{2(1)} = \frac{-2}{2} = -1$   
 $(-1, 0)$   
 $f(0) = 0^2 + 2(0) + 1 = 0 + 1 = 1$

- a)  $y = (x + 1)^2$
- b)  $(-1, 0)$
- c)  $x = -1$
- d) min at 0
- e) See graph
- f)  $(-1, 0)$
- g)  $(0, 1)$
- h)  $D: (-\infty, \infty)$   $R: [0, \infty)$
- i) Find  $f(0) = 1$



$\frac{-(-2)}{2(-1)} = \frac{2}{-2} = -1$   
 $(-1, 9)$   
 $f(-3) = -(-3)^2 - 2(-3) + 8 = -9 + 6 + 8 = -3 + 8 = 5$

- a)  $y = -(x + 1)^2 + 9$
- b)  $(-1, 9)$
- c)  $x = -1$
- d) max at 9
- e) See graph
- f)  $(-4, 0), (2, 0)$
- g)  $(0, 8)$
- h)  $D: (-\infty, \infty)$   $R: (-\infty, 9]$
- i) Find  $f(-3) = 5$

9-14. State if the equation is in vertex form or standard form or both. Then find the vertex for each equation.

9.  $y = (x-6)^2 + 3$

Vertex form  
(6, 3)

10.  $y = x^2 - 25$

Both  
(0, -25)

$(y = (x-0)^2 - 25)$

11.  $y = -2x^2 + 20x - 35$

Standard  
 $\frac{-20}{2(-2)} = \frac{-20}{-4} = 5$  (5, 15)  
 $-2(5)^2 + 20(5) - 35$

12.  $y = 5x^2 - 6$

Both  
(0, -6)

$(y = 5(x-0)^2 - 6)$

+8 +2  
✓ Comp

13.  $y = 4x^2 + 24x$

Standard  
(-3, -36)

$\frac{-24}{2(4)} = \frac{-24}{8} = -3$

$4(-3)^2 + 24(-3)$

$4(9) - 72$

$36 - 72$

$= -36$

14.  $f(x) = -3(x+2)^2 - 17$

Vertex form  
(-2, -17)

Writing Quadratic Equations Notes Name: \_\_\_\_\_ Hr: \_\_\_\_\_

**Type 1: Writing Equations of Quadratic Functions Given a Vertex and a Point**

If you are given a vertex and a point you can write the equation using vertex form.

Vertex form is:  $y = a(x-h)^2 + k$

When we look at vertex form we have five parts that are part of the equation. We need to find three of them, a, h, and k.

**Example 1:**

a) Given the following vertex and point label them as either x, y, h, or k.

vertex: (1, 2) and a point: (4, 8)



b) Using vertex form  $y = a(x-h)^2 + k$  put x, y, h, and k into the equation what variable is the unknown: a

$$8 = a(4-1)^2 + 2$$

c) Simplify the equation and solve for a.

$$8 = a(3)^2 + 2$$

$$8 = a \cdot 9 + 2$$

$$a = \frac{6}{9} = \frac{2}{3}$$

$$-8 = 9a + 2$$

$$\frac{6}{9} = \frac{9a}{9}$$

d) Now that you know a, put a, h, and k into the equation leaving x and y as variables.

$y = \frac{2}{3}(x-1)^2 + 2$ . This is the equation of the parabola in vertex form.

$$y = \frac{2}{3}(x-1)^2 + 2$$

(0, 6)

**Example 2:** Given the following vertex: (-2, 3) and a y intercept: 6. Find the equation of the parabola and then graph.

$$y = a(x-h)^2 + k$$

$$6 = a(0+2)^2 + 3$$

$$6 = 4a + 3$$

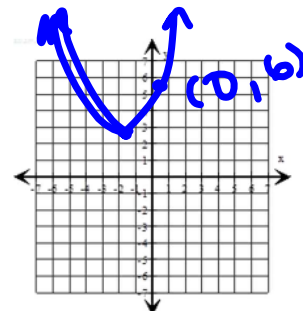
$$3 = 4a$$

$$\frac{3}{4} = a$$

$$y = \frac{3}{4}(x+2)^2 + 3$$

$$\text{up } 1 \cdot \frac{3}{4} = \frac{3}{4}$$

$$\text{up } 4 \cdot \frac{3}{4} = 3$$



## Catapult example...

Starting Point:

$(0, 0)$

Vertex:

$(80, 31)$

Ending Point:

$(160, 0)$

Vertex form:

$0 = a(0 - 80)^2 + 31$

$0 = 6400a + 31$

 $-31$ 

$$y = \frac{-31}{6400}(x - 80)^2 + 31$$

$$\frac{-31}{6400} = \frac{6400a}{6400}$$

$$a = \frac{-31}{6400}$$

• Predict the height when the ball has moved 12 inches horizontally.

$$y = \frac{-31}{6400}(12 - 80)^2 + 31 \approx 8.6 \text{ in high}$$

Predict the height when the ball has moved 32 inches horizontally.

$$y = \frac{-31}{6400}(32 - 80)^2 + 31 = 19.8 \text{ in high}$$

# due Friday

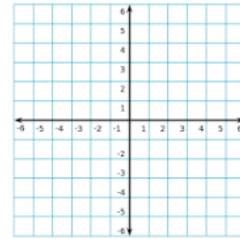
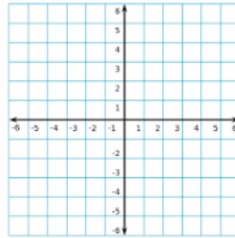
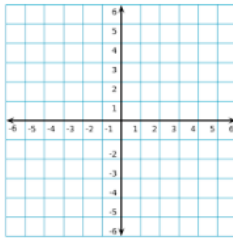
**Writing Quadratic Equations Day 1: Given a Vertex & a Point** Name: \_\_\_\_\_ Hr: \_\_\_\_\_

Write an equation for a quadratic function *in vertex form* given the following information.

1. Vertex: (2, 3) and a point (4, 5)    2. Vertex: (-5, -1) and a point (-6, 2)    3. Vertex: (2, -3) and y-intercept of -2

Write an equation for a quadratic function *in vertex form* given the following information. Then sketch a graph.

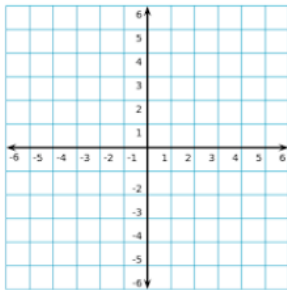
4. Vertex: (1, 4) and a point (2, 3)    5. Vertex: (3, 1) and a point (-1, 5)    6. Vertex: (1, 5) and a point (-1, -3)



7. Use the information provided to find the following:

Vertex: (2, -4) and x-intercept of 1

A) The equation for the quadratic function in vertex form.



B) Sketch a graph.

C) State the domain and range

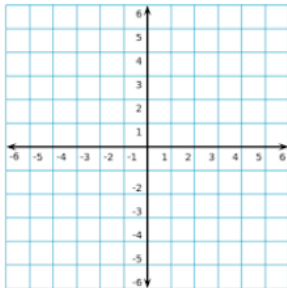
D) Determine if there is a max or min

E) Find  $f(1)$

8. Use the information provided to find the following:

Vertex: (-3, 4) and a point (1, -4)

A) The equation for the quadratic function in vertex form.



B) Sketch a graph.

C) State the domain and range

D) Determine if there is a max or min

E) Find  $f(-5)$

